

# (12) UK Patent Application (19) GB (11) 2 217 144 (13) A

(43) Date of A publication 18.10.1989

(21) Application No 8906831.6

(22) Date of filing 23.03.1989

(30) Priority data  
(31) 63075363 (32) 28.03.1988 (33) JP

(71) Applicants  
Toshiba Kabushiki Kaisha

(Incorporated in Japan)

72 Horikawa-cho, Saiwai-ku, Kawasaki-shi,  
Kanagawa-ken, Japan

Toshiba Audio Video Engineering Co Ltd

(Incorporated in Japan)

3-3-9 Shinbashi, Minato-ku, Tokyo, Japan

(72) Inventor  
Morio Ando

(51) INT CL<sup>4</sup>  
H04N 5/45 7/087

(52) UK CL (Edition J)  
H4F FD12X-FD2B FD22 FD30K FD31K FGH

(56) Documents cited  
GB 2187360 A GB 2165719 A GB 2062401 A  
GB 1576047 A EP 0229526 A2 EP 0129648 A2

(58) Field of search  
UK CL (Edition J) H4F FBA FBB FGG FGH FGJ  
FGS FGT, H4T TDAA  
INT CL<sup>4</sup> H04N

(74) Agent and/or Address for Service  
Marks & Clerk  
57-60 Lincoln's Inn Fields, London, WC2A 3LS,  
United Kingdom

## (54) Superimposing a teletext picture on a television picture

(57) Teletext data stored in a video RAM 34 is developed in a work RAM 26. A CPU 20 selectively deletes picture elements from the developed teletext data, to thereby compress the teletext data into data adapted for display in an auxiliary screen which is e.g. 1/4 of the display screen of CRT 40. The compressed teletext data is written into the video RAM 34. A display controller 30 supplies the compressed teletext data stored in the video RAM 34 to a synthesizing circuit 36, together with an appropriate display switching signal representing a timing for switching between the compressed teletext data and a TV broadcast video signal. In accordance with the display switching signal, the synthesizing circuit 36 selectively supplies the TV broadcast video signal and the compressed teletext data to a video output circuit 38. Accordingly, the teletext picture compressed to a 1/4 size is displayed on the display screen of the CRT 40 as an auxiliary screen image, while being superimposed on the TV picture.

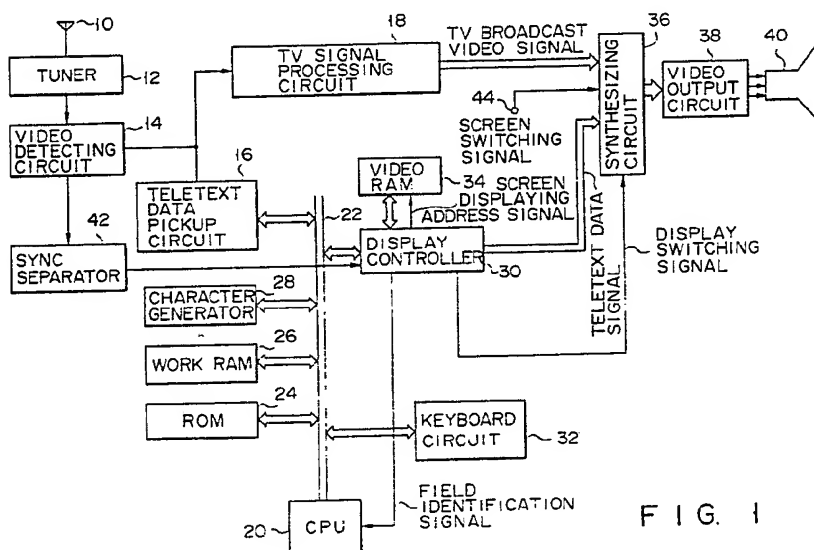


FIG. 1

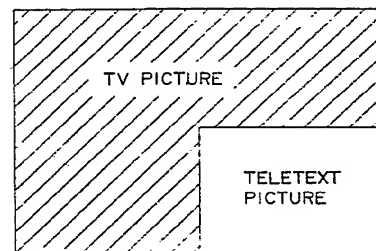


FIG. 3

GB 2 217 144 A

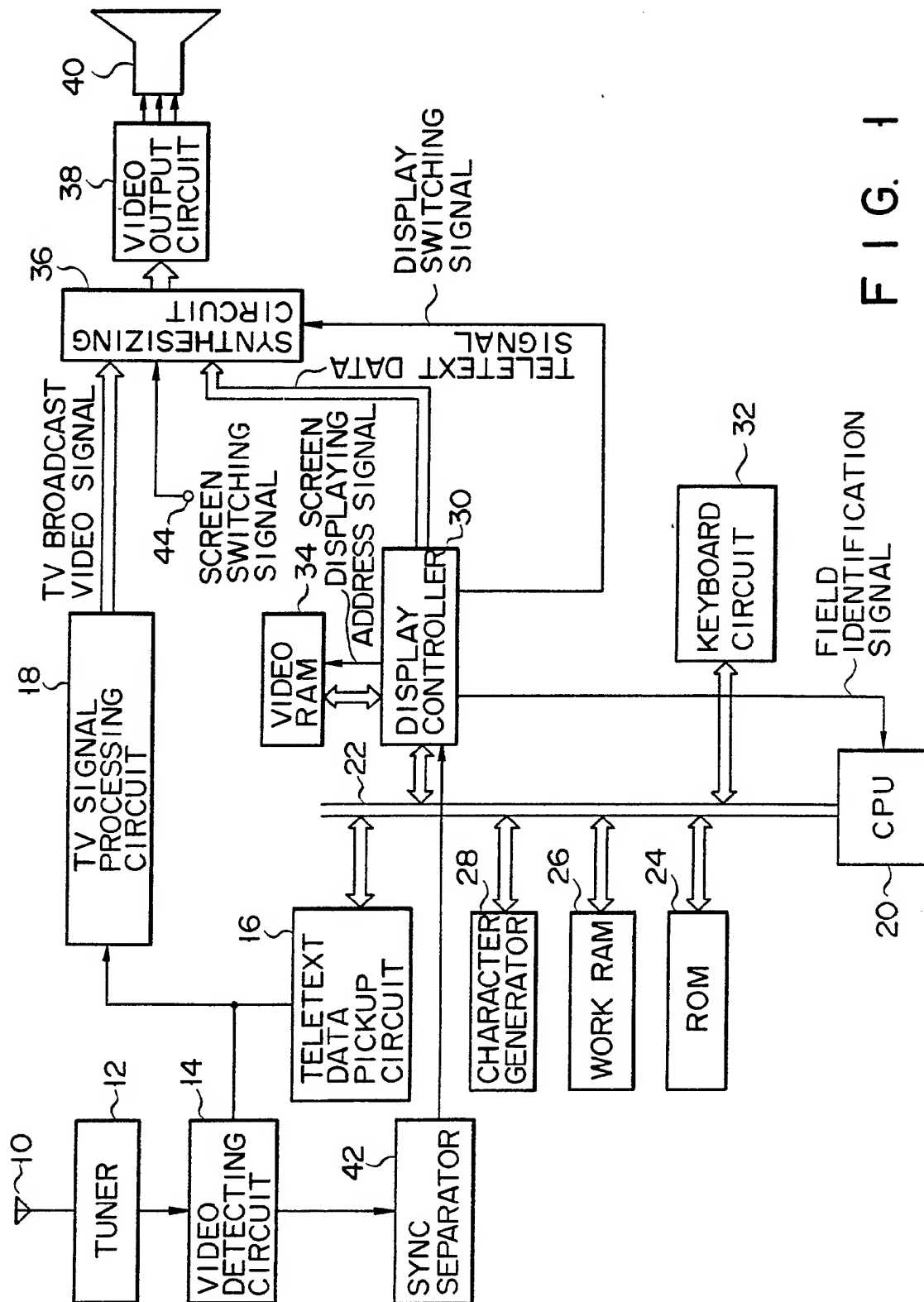


FIG. 1

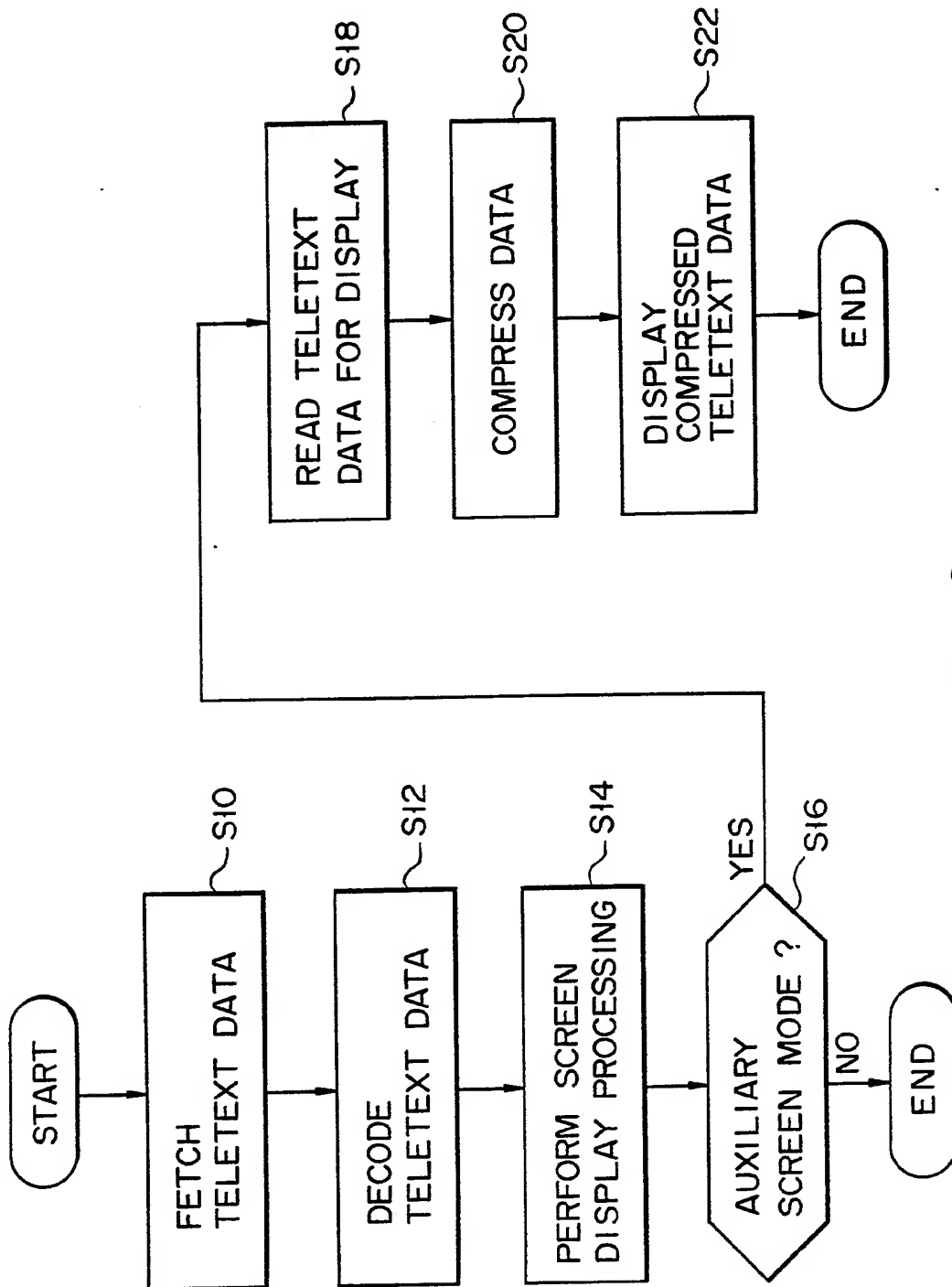


FIG. 2

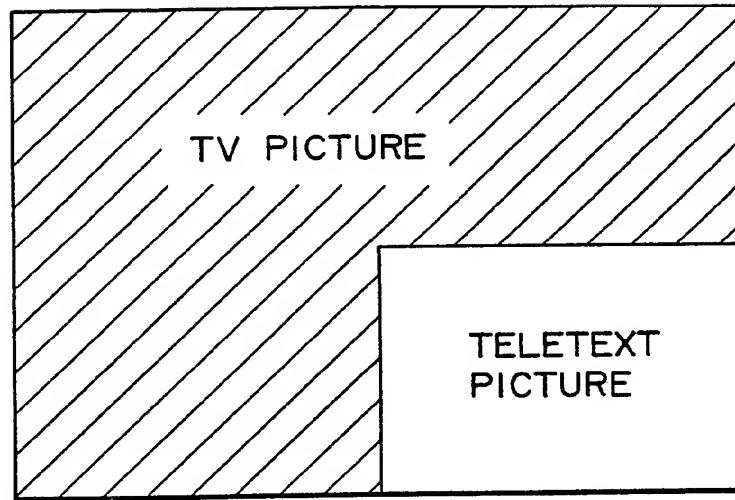


FIG. 3

FIG. 4A

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	○		●		○		●		○		●		○		●		○		●	
2																				
3	●		○		●		○		●		○		●		○		●		○	
4																				
5	○		●		○		●		○		●		○		●		○		●	
6																				
7	●		○		●		○		●		○		●		○		●		○	
8																				
9	○		●		○		●		○		●		○		●		○		●	
10																				
11	●		○		●		○		●		○		●		○		●		○	
12																				

FIG. 4B

	1	2	3	4	5	6	7	8	9	10
	(1)	(3)	(5)	(7)	(9)	(11)	(13)	(15)	(17)	(19)
1(1)	○	●	○	●	○	●	○	●	○	●
2(3)	●	○	●	○	●	○	●	○	●	○
3(5)	○	●	○	●	○	●	○	●	○	●
4(7)	●	○	●	○	●	○	●	○	●	○
5(9)	○	●	○	●	○	●	○	●	○	●
6(11)	●	○	●	○	●	○	●	○	●	○

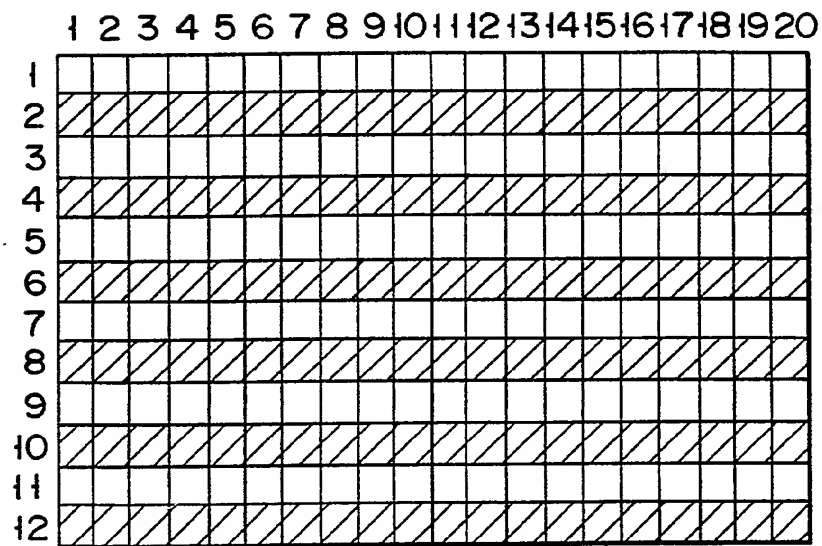


FIG. 5A

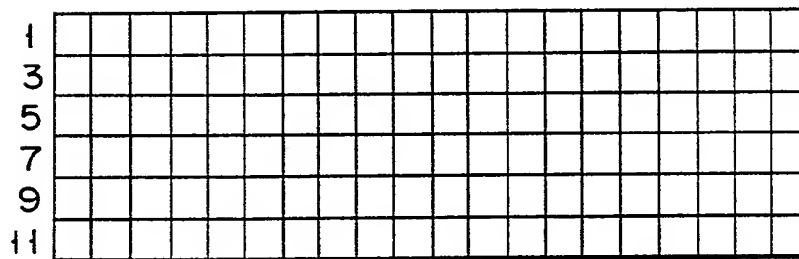


FIG. 5B

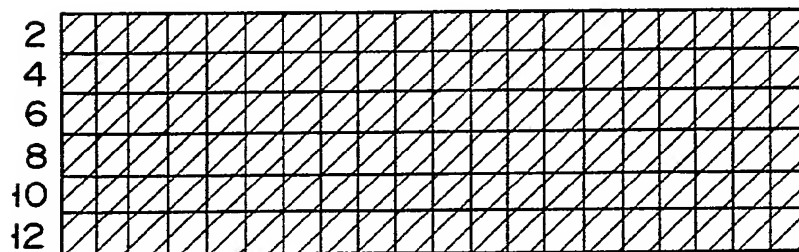


FIG. 5C

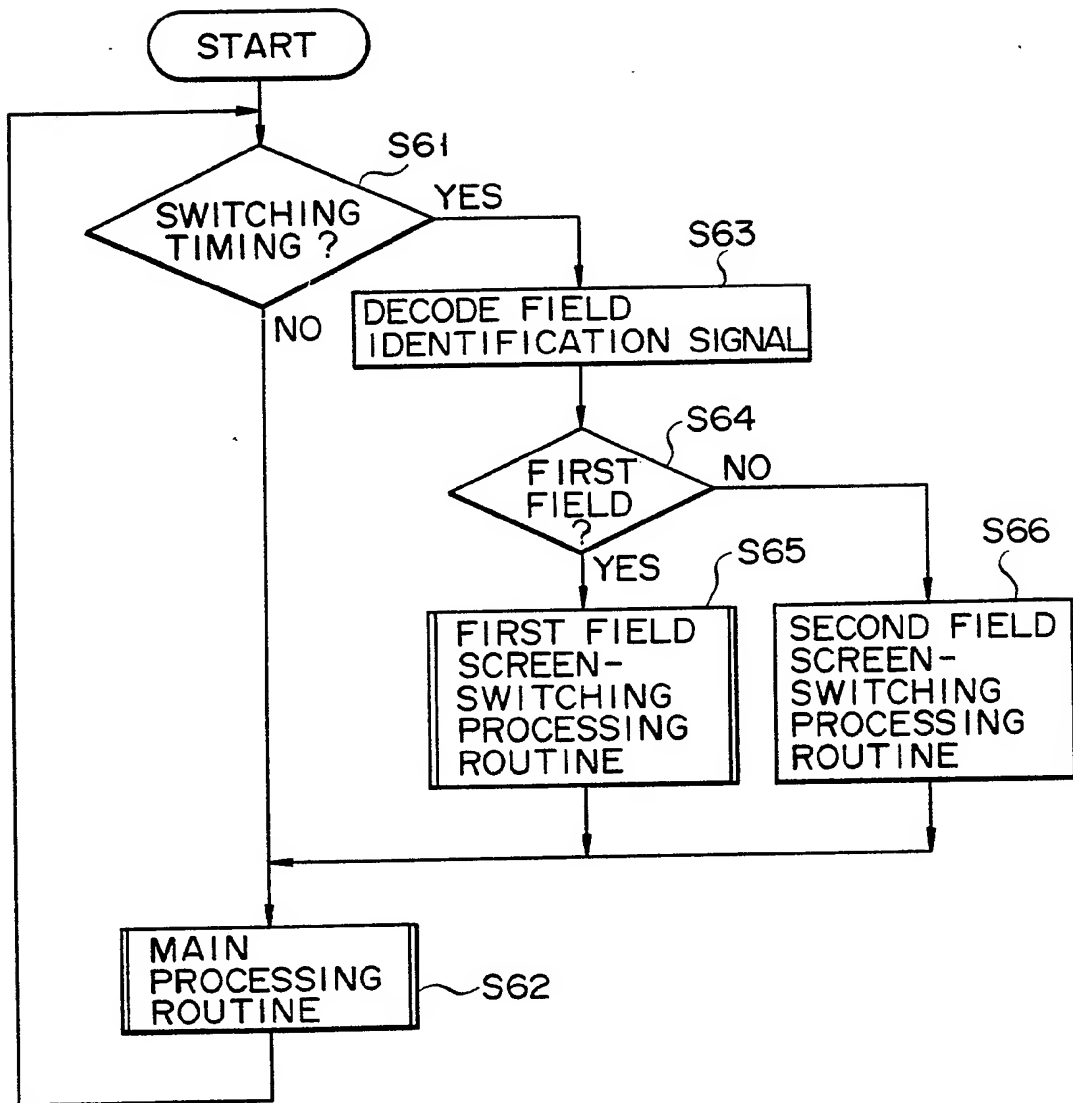


FIG. 6

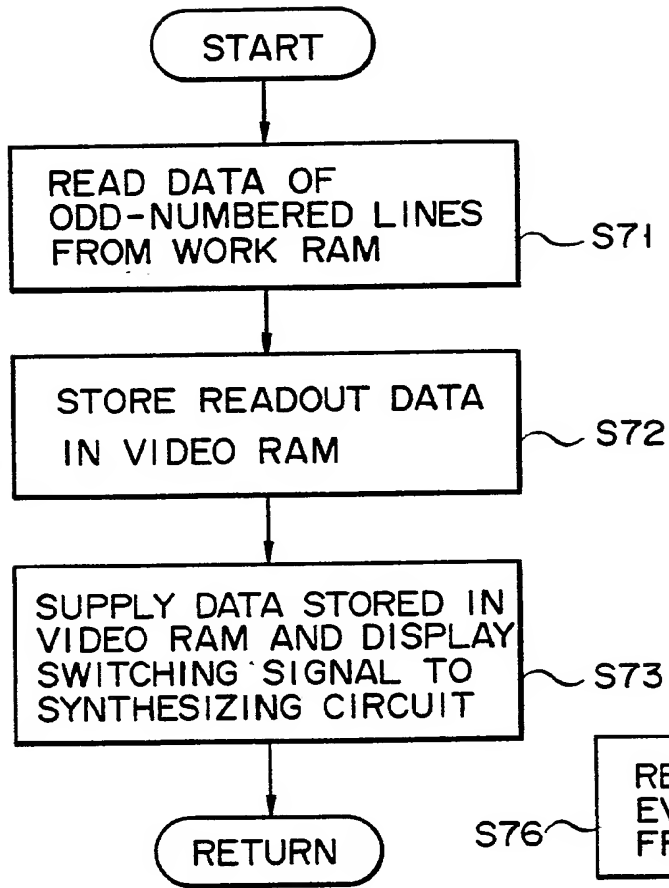


FIG. 7A

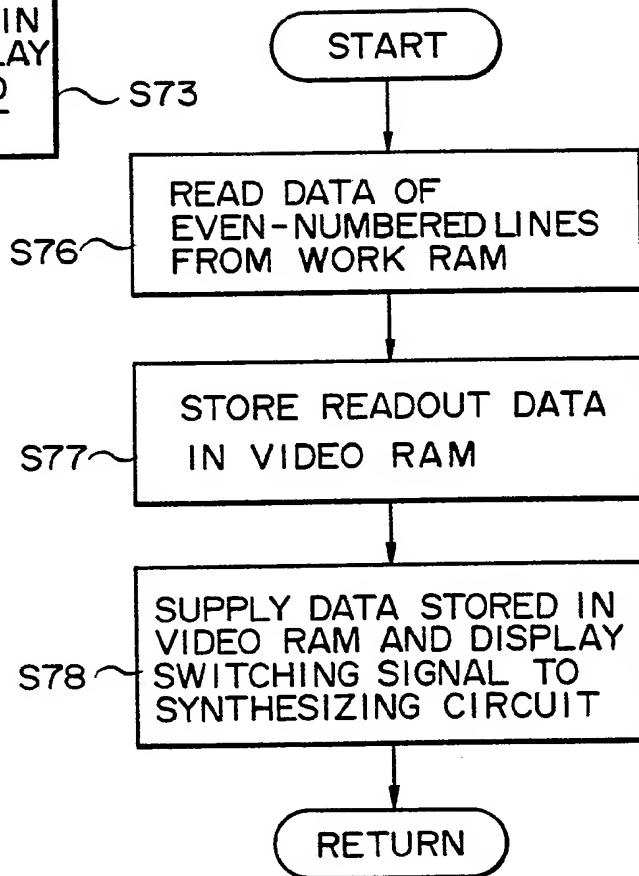
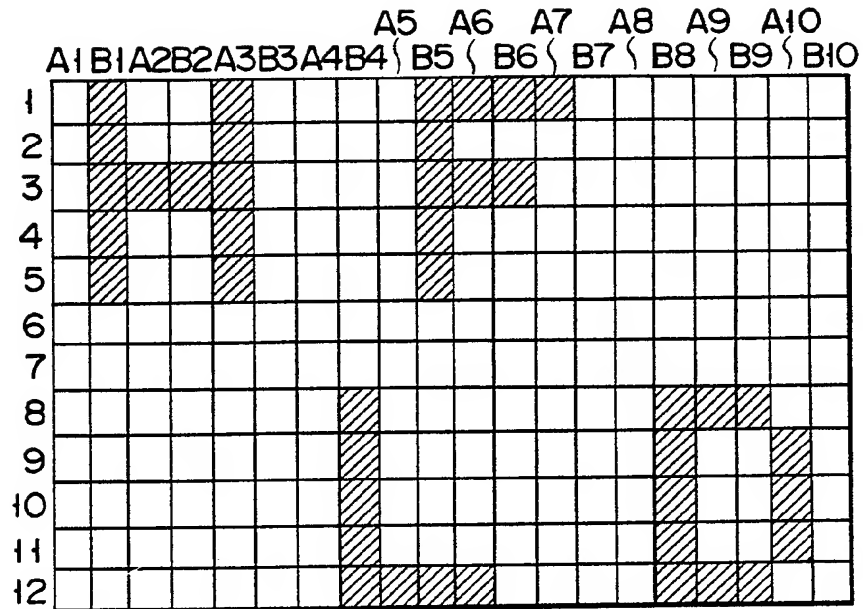
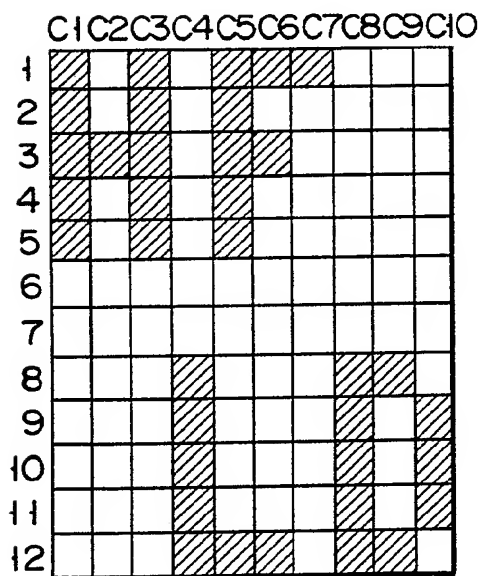


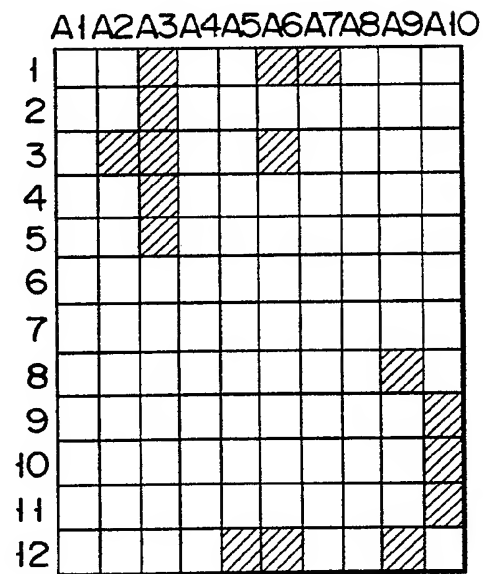
FIG. 7B



F I G. 8A

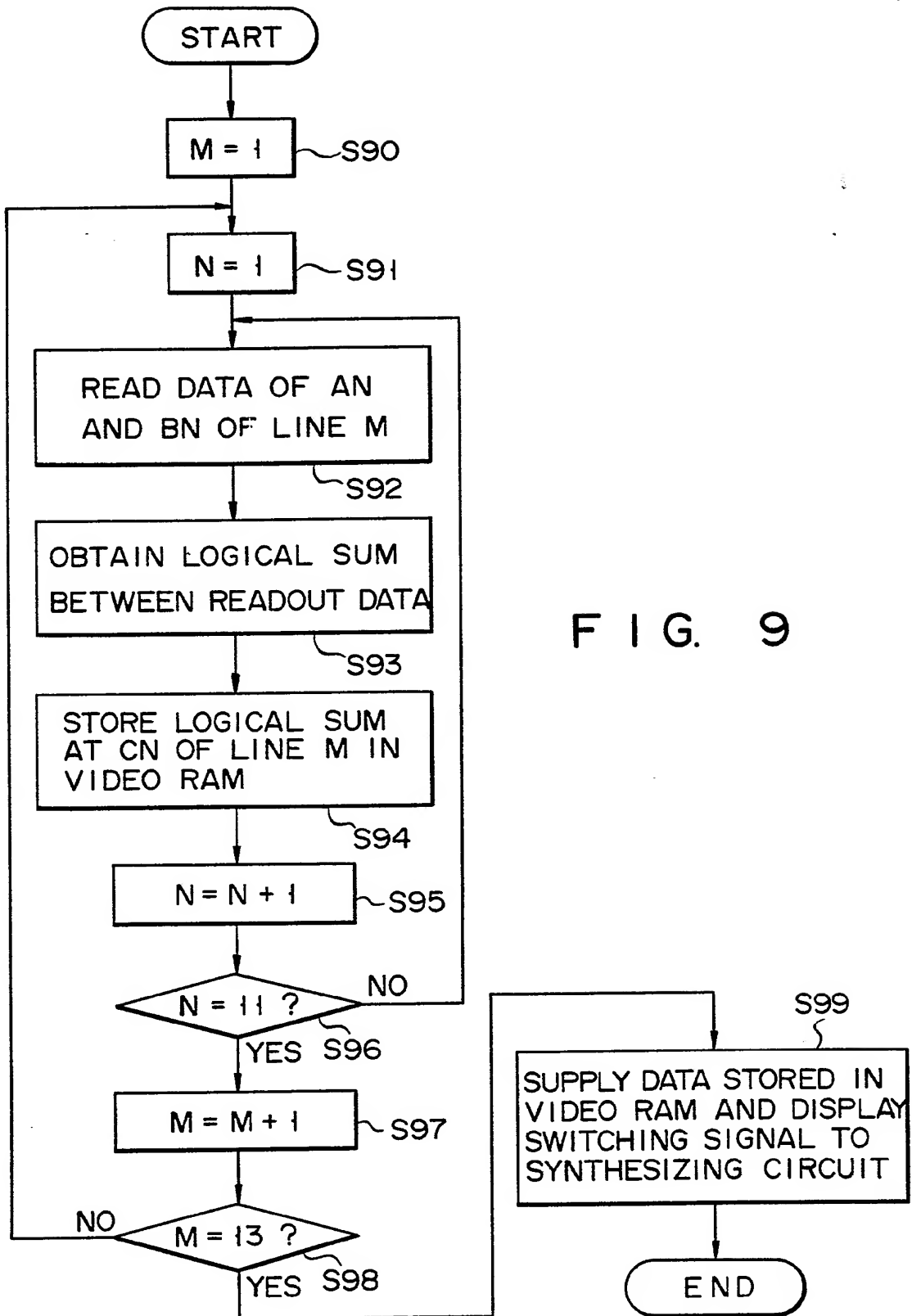


F I G. 8B



F I G. 10





"A TELEVISION RECEIVER WITH TELETEXT RECEIVING  
FUNCTION AND A METHOD FOR SUPERIMPOSING A TELETEXT  
PICTURE ON A TELEVISION PICTURE"

The present invention relates to a television  
receiver having the teletext receiving function, i.e., a  
5 function of displaying teletext pictures corresponding  
to teletext signals superimposed in the vertical blank-  
ing period of television signals. The present invention  
also relates to a method for superimposing a teletext  
picture on a television picture.

10 A character broadcasting system generally referred  
to as a teletext is available in these days. According  
to this character broadcasting system, a television (TV)  
broadcasting station superimposes coded character data  
on a TV signal during a predetermined horizontal  
15 scanning period of a vertical blanking period of the TV  
signal and transmits the coded character data together  
with the TV signal. A TV signal receiving station  
(i.e., a TV receiver) picks up the coded character data  
and decodes it into original character data for viewing  
20 on the TV screen.

A TV broadcasting station transmits a plurality of  
character broadcast programs by superimposing them in a  
plurality of horizontal scanning periods of the TV  
signal. Therefore, a user or viewer first selects the  
25 channel through which the character broadcast program he  
or she wants to view is transmitted by operating key  
input means, such as a remote control hand set, and then

designates the program number corresponding to the character broadcast program by operating the key input means, thereby viewing on the TV screen a teletext picture corresponding to the character broadcast program.

However, in a conventional TV receiver having a teletext receiving function, which allows the above teletext picture to be displayed on the TV screen, the TV display mode must be first switched to the teletext display mode, so as to monitor the character broadcast program. Therefore, when the user is viewing the teletext picture, he or she cannot know what information is displayed on the TV picture. Conversely, when the user is viewing the TV picture, he or she cannot know the information displayed on the teletext picture. In the conventional TV receiver, therefore, the teletext picture cannot be displayed on the TV screen without switching the mode from the TV display mode to the teletext display mode; the conventional TV receiver does not permit the user to view both the teletext picture and the ordinary TV picture at the same time.

Accordingly, an object of the present invention is to provide a television receiver with a teletext receiving function, which enables both a teletext picture and a television picture to be viewed at the same time by superposing them on each other. Another object of the

invention is to provide a superimposing method for superimposing a teletext picture on a television picture.

To achieve the first object, the present invention provides a television receiver which comprises signal  
5 receiving means for receiving a television broadcast signal including teletext data, television picture information pickup means for picking up television picture information from the television broadcast signal received by the signal receiving means, display means  
10 for displaying the television picture information picked up by the television picture information pickup means, teletext data pickup means for picking up the teletext data from the television broadcast signal received by the signal receiving means, storing means for temporarily  
15 storing the teletext data picked up by the teletext data pickup means, compression means for selectively compressing the teletext data stored in the storing means, and display control means for replacing part of the television picture information displayed on the  
20 display means with the teletext data compressed by the compressing means, whereby the teletext data is displayed on the display means as an auxiliary screen image, together with the television picture information.

25 To achieve the second object, the present invention provides a method for superimposing a teletext picture on a television picture, comprising the steps of

receiving a television broadcast signal including teletext data, picking up television picture information from a received television broadcast signal, displaying a television picture corresponding to the television picture information, picking up the teletext data from the received television broadcast signal, temporarily storing the teletext data, compressing a stored teletext data by selective deletion, and superimpressing a teletext picture corresponding to a compressed teletext data on the television picture by replacing part of the television picture with the teletext picture.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a block circuit diagram showing a television receiver with a teletext receiving function according to one embodiment of the present invention;

Fig. 2 is a flow chart illustrating the processings performed by a CPU shown in Fig. 1 for explaining the operation of the circuit shown in Fig. 1;

Fig. 3 is a view showing an example of the manner in which image display is performed;

Figs. 4A and 4B are views illustrating the first data compression method used in the present invention, more particularly, Fig. 4A showing the display condition before the data compression, and Fig. 4B showing the display condition after the data compression;

Figs. 5A to 5C are views illustrating the second data compression method used in the present invention, more particularly, Fig. 5A showing the display condition before the data compression, Fig. 5B showing the display  
5 condition at the first field after the data compression, and Fig. 5C showing the display condition at the second field after the data compression;

Fig. 6 is a flow chart illustrating the field switching operation performed for carrying out the data  
10 compression shown in Figs. 5A to 5C;

Fig. 7A is a flow chart illustrating how the first field screen-switching processing routine included in the flow chart of Fig. 6 are performed, and Fig. 7B is a flow chart illustrating how the second field screen-  
15 switching processing routine included in the flow chart of Fig. 6 are performed;

Figs. 8A and 8B are views illustrating the third data compression method used in the present invention, Fig. 8A showing the display condition before the data  
20 compression while Fig. 8B showing the display condition after the data compression;

Fig. 9 is a flow chart for explaining the compression method shown in Figs. 8A and 8B; and

Fig. 10 shows the display condition obtained when  
25 the screen shown in Fig. 8A is compressed by the first data compression method.

The present invention will now be described in

detail with reference to the accompanying drawings.

In the circuit shown in Fig. 1, a television (TV) broadcast signal superimposed teletext data including a teletext program the user desires to view is received by TV broadcast signal receiving antenna 10 and is tuned by tuner 12. After tuned, the TV broadcast signal is supplied to video detecting circuit 14 for video detection. A demodulated video signal output from video detecting circuit 14 is supplied to teletext data pickup circuit 16, by which teletext broadcast data is picked up from the demodulated video signal in the order of transmission. The demodulated video signal output from video detecting circuit 14 is also supplied to TV signal processing circuit 18, which is of a well-known type.

Teletext data pickup circuit 16 comprises a buffer memory for temporarily storing the picked-up teletext broadcast data. Teletext data pickup circuit 16 is connected to microcomputer (hereinafter referred to as a CPU) 20 through buss line 22. In addition to teletext data pickup circuit 16, the following are also connected to CPU 20 through bus line 22: ROM 24 for storing a program for displaying the teletext broadcast data; work RAM 26; character generator 28 for generating a character on the basis of the code included in the teletext broadcast data; display controller 30; and keyboard circuit 32. Keyboard circuit 32 includes various kinds of key switches and generates a signal corresponding to

an operated key switch. Needless to say, keyboard circuit 32 may be replaced with a circuit which receives an operation signal transmitted by key input means, such as a remote control hand set, and generates a signal corresponding to the received operation signal.

Display controller 30 stores an image data of characters successively generated by character generator 28 into video RAM 34. This RAM 34 is adapted to store teletext broadcast data. Display controller 30 also reads the teletext broadcast data out of video RAM 34 and supplies it to synthesizing circuit 36. More specifically, display controller 30 reads the teletext broadcast data by driving video RAM 34 on the basis of a screen displaying address and sends it to synthesizing circuit 36. Further, display controller 30 sends a display switching signal to synthesizing circuit 36.

The teletext broadcast data signal supplied from display controller 30 and the signal supplied from TV signal processing circuit 18 are selectively output from synthesizing circuit 36 in accordance with the display switching signal, whereby the signals are synthesized with each other. The synthesized signal is supplied to video output circuit 38. This video output circuit produces a video signal, which includes auxiliary screen (i.e. teletext picture) information associated with the teletext broadcast data synthesized by synthesizing circuit 36, and supplies the video signal to CRT 40.



Display controller 30 prepares a teletext picture display clock by use of a sync signal, which is supplied from sync separator 42 employed for separating the sync signal from the video detection output of video  
5 detecting circuit 14.

A description will no be given as to how the above TV receiver operates, with reference to the flow chart shown in Fig. 2 (in which the processings performed by CPU 20 are explained). First of all, CPU 20 causes  
10 teletext data pickup circuit 16 to fetch the data of the teletext broadcast program corresponding to the program number data supplied from keyboard circuit 32 (step S10). Specifically, CPU 20 checks the data which is stored in the buffer memory by teletext data pickup cir-  
15 cuit 16, on the basis of the program number data supplied from keyboard circuit 32, thereby searching for the teletext broadcast data of the teletext broadcast program corresponding to the program number data. If the teletext broadcast data searched for is found, it is  
20 decoded according to the program stored in ROM 24 (step S12). Specifically, CPU 20 causes character generator 28 to generate characters corresponding to the fetched teletext broadcast data, thereby developing the teletext broadcast data into data adapted for display.

25 Next, screen display processings are performed (step S14). In the processings, the teletext broadcast data is transferred to display controller 30, where it

is written into video RAM 34.

In display controller 30, it is determined whether the TV receiver is set in the auxiliary screen display mode (step S16). If it is determined that the apparatus  
5 is not set in the auxiliary screen display mode, then display controller 30 supplies the screen displaying address signal to video RAM 34 in synchronism with a raster scan, so as to supply the teletext broadcast data signal to synchronizing circuit 36. At this time,  
10 synthesizing circuit 36 is set in the mode for selecting and outputting the teletext broadcast data since, during the normal display mode, circuit 36 receives a screen switching signal supplied from keyboard circuit 32 through terminal 44. Therefore, synthesizing circuit 36  
15 supplies the teletext broadcast data signal to video output circuit 32. As a result, the teletext broadcast program selected by the key operation at keyboard circuit 32 is displayed on the display screen of CRT 40.

In the case where a TV broadcast signal is display-  
20 ed, the screen switching signal supplied to terminal 44 is a signal that causes synthesizing circuit 36 to select and output the TV broadcast video signal supplied from TV signal processing circuit 18. Therefore, synthesizing circuit 36 supplies the selected TV broad-  
25 cast video signal to the screen of CRT 40 through the video output circuit 38.

A description will now be given as to how the

teletext broadcast data is displayed in the auxiliary display screen. When a signal causing the teletext broadcast data to be displayed in the auxiliary display screen is supplied to CPU 20 from keyboard circuit 32,  
5 CPU 20 decodes this data, for establishing the auxiliary screen display mode. Where the auxiliary screen display mode is set in step S16, CPU 20 performs the processings for reading the teletext broadcast data (step S18). That is, CPU 20 supplies a read control signal to  
10 display controller 30. Therefore, display controller 30 read the teletext broadcast data from video RAM 34 and transfers the data into work RAM 26.

After the teletext broadcast data is transferred into work RAM 26, CPU 20 selectively deletes the tele-  
15 text broadcast data, whereby the data is compressed (step S20). In this manner, the teletext broadcast data is processed into data adapted for display in the auxiliary display screen and therefore can be displayed in the auxiliary display screen which is 1/4 or 1/2 of the  
20 normal display screen.

After preparing the compressed teletext broadcast data, which is adapted for display in the auxiliary display screen, CPU 20 performs processings for displaying the compressed teletext broadcast data (step S22).  
25 Specifically, the compressed teletext data is transferred to display controller 30. Display controller 30 stores the compressed teletext data in video RAM 34.

Thereafter, display controller 30 supplies the compressed teletext broadcast data signal from video RAM 34 to synthesizing circuit 36. At this time, a display switching signal, i.e., a timing signal permitting the compressed teletext data signal to be displayed in accordance with the raster scan of the TV broadcast signal, is also supplied to synthesizing circuit 36. In this fashion, the teletext broadcast program (teletext picture) is displayed as auxiliary screen data, together with the TV broadcast program (TV picture) displayed on the TV broadcast screen.

Fig. 3 shows an example of the screen on which the teletext picture is shown as auxiliary screen data. As is shown in Fig. 3, the teletext picture is displayed in the lower right quadrant of the TV picture displayed in the TV display screen (i.e., a main screen). In the case shown in Fig. 3, the teletext picture is displayed such that it occupies 1/4 of the entire TV picture. Needless to say, the teletext picture can be displayed in the main screen, with the TV picture displayed on the auxiliary screen. The position of the auxiliary display screen can be freely determined by simply causing display controller 30 to output appropriately the compressed teletext broadcast data signal and an appropriate display switching signal. In addition, the main screen can be divided into four quadrants, for displaying four teletext broadcast programs,

respectively.

A description will now be given as to how the selective deletion of data (i.e., data compression) is performed for permitting the teletext broadcast data adapted for display to be displayed in the auxiliary screen.

Let it be assumed that teletext broadcast data is displayed on a TV screen having twelve rasters and twenty picture elements aligned in the horizontal direction, as is shown in Fig. 4A. As a result of the data compression, the teletext broadcast data is compressed in the manner shown in Fig. 4B. As can be understood from Figs. 4A and 4B, the image data after the data compression is obtained by selecting every second picture element in both the horizontal and vertical directions from the image data before the data compression. More specifically, the first picture element data of the first line of the original image data is shown as the first picture element data of the first line of the compressed image data, the seventh picture element data of the third line of the original image data is shown as the fourth picture element of the second line of the compressed image data, and so on.

Figs. 5A to 5C illustrate the second data compression method used in the present invention. Fig. 5A shows a screen condition before the data compression, and Figs. 5B and 5C show screen conditions obtained

after the data compression. The screen shown in Fig. 5A is equal in size to that shown in Fig. 4A, so that it has twelve rasters and twenty picture elements aligned in the horizontal direction. In Fig. 5A, the odd-  
5 numbered lines (i.e., the first line, third line, fifth line, ...) represent the first field of data, and the even-numbered lines (i.e., the second line, fourth line, sixth line, ...) represent the second field data. According to the second data compression method, the  
10 first and second fields of data are alternately displayed on the TV display screen, so that the image data can be compressed without losing any of the first and second fields. Specifically, the image shown in Fig. 5B is displayed in the first field period, and the  
15 image shown in Fig. 5C is displayed in the second field period. Therefore, the original image data can be compressed such that its size is reduce to half in the horizontal direction.

The field switching processings performed for  
20 displaying the above compressed data will now be described, with reference to the flow chart shown in Fig. 6. First of all, it is determined whether or not the time is appropriate for switching (step S61). This determination of the switching timing is performed based  
25 on the detection of a vertical sync signal supplied from sync separator 42. If the vertical sync signal is not detected (i.e., "NO" is step S61), normal display

processings (i.e., the main processing routine) are performed (step S62), so that the teletext broadcast data is stored in video RAM 34 and one field of data is displayed in the auxiliary display screen. If the  
5 vertical sync signal is detected, (i.e., "YES" in step S61), display controller 30 supplies the field identification signal to CPU 20, for the decoding of the field identification signal (step S63). As is shown in Fig. 1, the field identification signal is supplied  
10 directly to CPU 20.

By decoding the field identification signal, CPU 20 determines whether the field is the first one or the second one (step S64). If the field is determined to be the first one, the first field screen-switching processing routine is executed (step S65), thereby displaying  
15 the first field of data in the auxiliary display screen, as is shown in Fig. 5B. If the field is determined to be the second one, the second field screen-switching processing routine is executed (step  
20 S66), thereby displaying the second field of data in the auxiliary display screen, as is shown in Fig. 5C. After displaying the compressed data in this fashion, the main processing routine is executed (step S62), and then the flow returns to step S61 for determining once again  
25 whether or not the time is appropriate for switching.

Fig. 7A is a flow chart explaining the first field screen-switching processing routine performed in step

S65. As is shown in Fig. 7A, CPU 20 reads the only  
teletext broadcast data of the odd-numbered lines from  
the teletext broadcast data stored in work RAM 26, and  
transfers the read data to display controller 30 (step  
5 S71). Display controller 30 stores the data of the odd-  
numbered lines in video RAM 34 (step S72). Then display  
controller 30 supplies the compressed teletext broadcast  
data stored in video RAM 34 to synthesizing circuit 36,  
together with the appropriate display switching signal  
10 (step S73).

Fig. 7B is a flow chart explaining the second field  
screen-switching processing routine performed in step  
S66. As is shown in Fig. 7B, CPU 20 reads the only the  
teletext data of the even-numbered lines from the  
15 teletext broadcast data stored in work RAM 26, and  
transfers the read data to display controller 30 (step  
S76). Display controller 30 stores the data of the  
even-numbered lines in video RAM 34 (step S77). Then,  
display controller 30 supplies the compressed teletext  
20 broadcast data stored in video RAM 34 to synthesizing  
circuit 36, together with the appropriate display  
switching signal (step S78).

According to the second compression method  
mentioned above, the compressed teletext broadcast data  
25 is displayed in either the upper or lower half of the TV  
screen. Since, in this case, the teletext broadcast  
data cannot be displayed with a scale of 1/4, the third



compression method shown in Figs. 8A and 8B is used in conjunction with the second compression method. Fig. 8A shows a screen which has twelve rasters and twenty picture elements aligned in the horizontal direction, like the screens shown in Figs. 4A and 5A, and Fig. 8B shows a compressed image displayed on the screen of Fig. 8A. As is shown in Fig. 8A, characters "H", "F", "L", and "D" are indicated by means of predetermined display blocks. To compress this image data into that shown in Fig. 8B, the logical sum between an even-numbered vertical picture element row and its adjacent odd-numbered vertical picture element row is detected. More specifically, the logical sums between rows A1 and B1, between rows A2 and B2, between rows A3 and B3, between rows A4 and B4, between rows A5 and B5, between rows A6 and B6, between rows A7 and B7, between rows A8 and B8, between rows A9 and B9, and between rows A10 and B10 are detected. Image data obtained on the basis of these logical sums is used as image data for producing a compressed image.

In Fig. 8B, picture element row C1 is the row obtained on the basis of the logical sum between picture element rows A1 and B1 shown in Fig. 8A, and picture element row C2 is the row obtained on the basis of the logical sum between picture element rows A2 and B2 shown in Fig. 8A. Likewise, row C3 corresponds to the logical sum between A3 and B3; row C4 to that between A4 and B4;

row C5 to that between A5 and B5; row C6 to that between A6 and B6; row C7 to that between A7 and B7; row C8 to that between A8 and B8; row C9 to that between A9 and B9; and row C10 to that between A10 and B10.

5           The image data produced on the basis of the above logical sums will be explained in more detail. In Fig. 8A, first picture element A1 of the first line is a blank portion (which is not part of a character), and its adjacent picture element B1 is an oblique line  
10           portion (which is part of a character). If first and second picture elements A1 and B1 are treated as logical "0" and logical "1", respectively, their logical sum is "1", so that picture element data of logical "1" is displayed in first picture element C1 of the first line  
15           of the compressed screen, as is indicated by the oblique line portion in Fig. 8B. Likewise, the logical sum between picture elements A2 and B2 of the third line shown in Fig. 8A is "1", so that picture element data of logical "1" (which picture element data constituting the  
20           central line of character "H") is displayed in second picture element C2 of the third line of the compressed screen, as is indicated by the oblique lines in Fig. 8B.

          Fig. 9 is a flow chart according to which the third  
25           compression method is carried out. This flow chart is applicable to the case where data displayed on a TV screen having twelve lines and twenty picture elements aligned in the horizontal direction as is shown in

Fig. 8A is compressed to data displayed on a screen having twelve lines and ten picture elements aligned in the horizontal direction as is shown in Fig. 8B.

Referring to the flow chart shown in Fig. 9, CPU 20  
5 initializes M and N counters by setting "1" to them  
(steps S90 and S91). The M and N counters may be either  
hardware ones or software ones. In accordance with the  
values of the counters, CPU 20 reads the data of picture  
elements AN and BN of line M from the teletext broadcast  
10 data stored in work RAM 26 (step S92), and obtains the  
logical sum between the read data (step S93). The data  
on the logical sum is supplied to display controller 30,  
together with the data on the values of the M and N  
counters. On the basis of the values of the M and N  
15 counters, display controller 30 stores the logical sum  
data at picture element CN of line M of video RAM 34  
(step S94).

Next, CPU 20 increases the value of the N counter  
with an increment of one (step S95), and then determines  
20 whether or not the value of the N counter is smaller  
than "11" (step S96). If the value is determined to be  
lower than "11", then the flow returns to step S92, so  
as to read the next pair of picture elements. If the  
value is determined to have reached "11", then the value  
25 of the M counter is increased with an increment of one  
(step S97). Next, it is determined whether or not the  
value of the M counter is smaller than "13" (step S98).

If the value of the M counter is determined to be smaller than "13", then the flow returns to step S91, so as to read the first two picture elements of the next line. However, if the value of the M counter is  
5 determined to have reached "13", then CPU 20 considers the compression processings to have been completed, and supplies a control signal representing to that effect to display controller 30.

In response to the control signal, display  
10 controller 30 supplies both the compressed teletext broadcast data stored in video RAM and the appropriate display switching signal to synthesizing circuit 36 (step S99). As a result, a compressed auxiliary screen image is displayed in part of the TV picture on the  
15 display screen of CRT 40 as is shown in Fig. 8B.

As can be understood from Fig. 8B, the data on each character is not lost after the above compression.

As explained above with reference to Figs. 8A, 8B and 9, the screen is compressed into a screen whose size  
20 is half that of the original screen in the vertical direction. Therefore, auxiliary screen data adapted for display in the 1/4-sized screen can be prepared by using the third compression method in conjunction with the second compression method wherein the fields of data are  
25 switched for display, as explained above with reference to Figs. 5A-5C, 6, and 7A-7B. More specifically, the compressed teletext broadcast data for display stored in

video RAM 34 is transferred further into work RAM 26,  
and is processed according to the flow charts shown in  
Figs. 6, 7A, and 7B.

5 In the first compression method explained with  
reference to Figs. 4A and 4B, odd-numbered picture  
element rows B1-B10 are all deleted. As can be under-  
stood from Fig. 10, therefore, the data on each charac-  
ter is lost to a certain extent after the compression  
method. Therefore, the third compression method is  
10 preferable to the first compression method.

As mentioned above, the TV receiver of the present  
invention, having a teletext receiving function, uses  
the above compression methods and thereby enables  
teletext broadcast data (teletext picture) to be  
15 displayed on the TV display screen (TV picture) as  
auxiliary screen information, without substantially  
losing the data on each character.

Claims:

1. Television receiver capable of receiving and displaying teletext data, comprising:

5 signal receiving means for receiving a television broadcast signal including teletext data;

television picture information pickup means for picking up television picture information from the television broadcast signal received by said signal receiving means;

10 display means for displaying the television picture information picked up by said television picture information pickup means;

teletext data pickup means for picking up the teletext data from the television broadcast signal  
15 received by said signal receiving means;

storing means for temporarily storing the teletext data picked up by said teletext data pickup means;

compression means for selectively compressing the teletext data stored in said storing means; and

20 display control means for replacing part of the television picture information displayed on said display means with the teletext data compressed by said compressing means, whereby the teletext data is displayed on said display means as an auxiliary screen image,  
25 together with the television picture information.

2. The television receiver according to claim 1, wherein said compression means includes means for

compressing the teletext data stored in said storing means by deleting every second picture element in both horizontal and vertical directions of a display screen of said display means.

5           3. The television receiver according to claim 1, wherein said compression means includes:

          first compressing means for compressing the teletext data stored in said storing means by selectively deleting, in a first field of interlaced  
10 scanning, those picture elements which are to be displayed in a second field; and

          second compressing means for compressing the teletext data stored in said storing means by selectively deleting, in the second field of interlaced  
15 scanning, those picture elements which are to be displayed in the first field.

          4. The television receiver according to claim 3, wherein said compressing means further includes third compressing means for compressing the teletext data  
20 stored in said storing means by using a logical sum between two picture elements vertically adjacent on the display screen of said display means as a vertical picture element.

          5. The television receiver according to claim 3,  
25 wherein said display control means includes means for displaying the teletext data compressed by said first and second compressing means on said display means as

the auxiliary screen image while simultaneously switching the first and second fields of the teletext data.

5       6. The television receiver according to claim 5, wherein said compressing means further includes third compressing means for compressing the teletext data stored in said storing means by using a logical sum between two picture elements vertically adjacent on the display screen of said display means as a vertical  
10       picture element.

      7. The television receiver according to claim 1, wherein said compressing means includes means for compressing the teletext data stored in said storing means by using a logical sum between two picture  
15       elements vertically adjacent on the display screen of said display means as a vertical picture element.

      8. A method for superimposing a teletext picture on a television picture, comprising the steps of:

      receiving a television broadcast signal including  
20       teletext data;

      picking up television picture information from a received television broadcast signal;

      displaying a television picture corresponding to the television picture information;

25       picking up the teletext data from the received television broadcast signal;

      temporarily storing the teletext data,



compressing a stored teletext data by selective deletion; and

superimposing a teletext picture corresponding to a compressed teletext data on the television picture by  
5 replacing part of the television picture with the teletext picture.

9. The method according to claim 8, wherein said compressing step includes a step of compressing the stored teletext data by deleting every second picture  
10 element in both horizontal and vertical directions of the television picture.

10. The method according to claim 8, wherein said compressing step includes:

a first compressing step of compressing the stored  
15 teletext data by selectively deleting, in a first field of interlaced scanning, those picture elements which are to be displayed in a second field; and

a second compressing step of compressing the stored teletext data by selectively deleting, in the second  
20 field of interlaced scanning, those picture elements which are to be displayed in the first field.

11. The method according to claim 10, wherein said compressing step further includes a third compressing step of compressing the stored teletext data by using a  
25 logical sum between two picture elements vertically adjacent on the television picture as a vertical picture element.

12. The method according to claim 10, wherein said superimposing step includes a step of alternately superimposing the teletext data compressed by said first and second compressing steps while simultaneously  
5 switching the first and second fields of the teletext data.

13. The method according to claim 12, wherein said compressing step further includes a third compressing step of compressing the stored teletext data by using a  
10 logical sum between two picture elements vertically adjacent on the television picture as a vertical picture element.

14. The method according to claim 8, wherein said compressing step includes a step of compressing the  
15 stored teletext data by using a logical sum between two picture elements vertically adjacent on the television picture as a vertical picture element.

15. A television receiver, substantially as hereinbefore described with reference to the accompanying  
20 drawings.

16. A method for superimposing a teletext picture on a television picture, substantially as hereinbefore described with reference to the accompanying drawings.